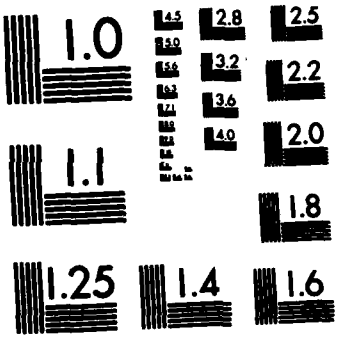
AD-A124 176 LESSONS LEARNED FROM THE ORIGINAL STATEMENT OF WORK(U) 1/1
BATTELLE COLUMBUS LABS OH J D HILL ET AL. 14 MAY 82
F33600-80-C-0414

UNCLASSIFIED F/G 5/1 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

PHOTOGRAPH THIS SHEET

DTIC ACCESSION NUMBER

AD A124176

LEVEL

INVENTORY

Lessons Learned from the Original Statement of Work

DOCUMENT IDENTIFICATION

Contract F33600-80-C-0414

14 May 82

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR	
NTIS	GRA&I
DTIC	TAB
UNANNOUNCED	
JUSTIFICATION	
BY	Per Ltr. on file
DISTRIBUTION / AVAILABILITY CODES	
DIST	AVAIL AND/OR SPECIAL
A	

DTIC
ELECTE
FEB 8 1983
D

DATE ACCESSIONED

DTIC COPY INSPECTED

DISTRIBUTION STAMP

83 02 07 104

DATE RECEIVED IN DTIC

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDA-2

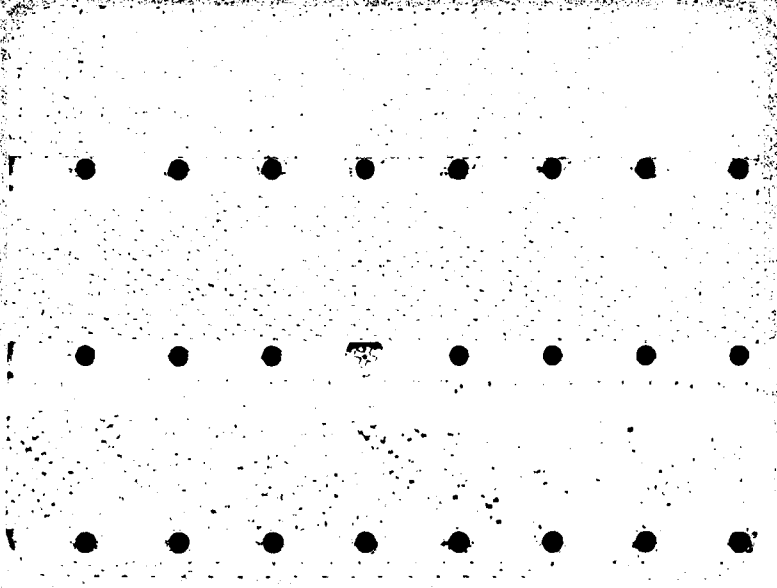
DTIC FORM OCT 79 70A

DOCUMENT PROCESSING SHEET

AD A124176

Battelle
Columbus Laboratories

Report



DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

REPORT

on

LESSONS LEARNED FROM THE ORIGINAL STATEMENT OF WORK

to

Directorate of Logistics Management
Systems Requirements (XRB)
DCS/Plans and Programs
Air Force Logistics Command
Wright-Patterson AFB, Ohio 45433

(Contract No. F33600-80-C-0414)

May 14, 1982

by

J.D. Hill and K.V. Miller

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

TABLE OF CONTENTS

	Page No.
INTRODUCTION	1
SCENARIOS	2
ANALYSIS	5
LMS PRINCIPLES	8
LOGICAL APPLICATION GROUPS (LAGs)	16
CONCLUSIONS AND RECOMMENDATIONS	19

REPORT

on

LESSONS LEARNED FROM THE ORIGINAL STATEMENT OF WORK

to

Directorate of Logistics Management
Systems Requirement (XRB)
DCS/Plans and Programs
Air Force Logistics Command
Wright-Patterson AFB, Ohio 45433

May 14, 1982

by

J.D Hill and K.V. Miller

BATTELLE
Columbus Laboratories

INTRODUCTION

The purpose of this report is to document lessons learned during the early stages of the Logistics Management System (LMS) planning activities. As the planning activities took place, several deviations from the original methodology occurred. This document describes the reason for these changes. The lessons learned are in four major areas:

- Scenarios
- Analysis
- LMS Principles
- Logical Application Groups (LAGs).

Throughout this report references are made to work done by Battelle under other contracts with the Air Force Logistics Command. These contracts are specified as appropriate.

SCENARIOS

The following paragraphs describe the original requirement for the use of scenarios, as identified in Paragraph F-4, Contract F33600-80-C-0414.

Scenarios: Using existing information from AFLC, AF, SAF, and OSD documents the contractor shall develop hypothetical scenarios for use in planning through the 1990s. It is assumed that several scenarios structured around the logistics areas will be more workable than a single, all-encompassing scenario. The scenarios must identify a reasonable range of alternatives, e.g., optimistic, most-likely, and pessimistic. The scenarios should address such things as: (1) AFLC mission; (2) logistics responsibilities and methods; (3) interface with DLA, GSA, AF, other services, and using commands; (4) resources; (5) organization; (6) contractor support; and (7) geographical alignment. The scenarios will be tailored for use in long-range LMS planning.

a. The contractor shall recommend an approach to develop and apply mutliple scenarios. It is assumed the multiple scenarios should be generally in accord with the theory and techniques of business and industry (e.g., scenarios in the context of the article, "Does Futures Research Have a Corporate Role", by Clark Holloway, Long Range Planning, Oct 1978; or "The Use of Multiple Scenarios by U.S. Industrial Companies", by Robert E. Linneman and Harold E. Klein, Long Range Planning, Feb 1979). These multiple scenarios should not be confused with the specific USAF product "wartime scenario". The contractor recommendation shall consider; (1) The involvement/application of USAF wartime scenarios in the LMS planning effort, and (2) The application of scenarios as proposed in the Final Report, Contract F33600-78-C-0510. The approach shall include a procedure to control updates and modifications to the scenarios.

b. Upon approval of the approach, the contractor shall develop and submit the format to be used to the government for approval. Said format shall be designed to facilitate functional planner identification of LMS needs and provide a means to control and evaluate these needs. The scenarios will be the only purveyor of the futuristic information required for planning; therefore all such information must be included in, by attachment or reference, said scenarios.

c. Upon approval of 4b above, the contractor shall prepare hypothetical scenarios for use in the planning sessions. The futuristic content of the scenarios may be obtained through forecasts, planning documents, expert testimony, etc. In those instances where necessary information is not available, the contractor will hypothesize the information. In all cases, the contents must be reasonable and credible to the planners. The contractor will identify the source of the information used in the scenarios. The level of detail for those areas to be covered in planning sessions must represent that which is recommended for long term effort.

During the period July 7-11, 1980, Battelle Columbus staff acted as facilitators for a Policy Planning meeting held at Randolph AFB, San Antonio, Texas. This General Officer level meeting was originally designed around the use of scenarios and cognitive maps. They were to be used to generate directed discussion of AFLC policies needed to assure the responsiveness of AFLC over the next 10 to 15 years to both effective support to the operational forces in wartime and economical operation in peacetime.

Two types of scenarios were made available. The first type was selected from standard Air Force scenarios contained in the Consolidated Guidance. The second was a set of three theme scenarios developed by Battelle to portray three different alternative sets of world conditions in the next 10 to 15 years and relate them to the impact on AFLC. The latter scenarios were supported by cognitive maps that portray the interactions among the various drivers and descriptors.

While the availability of scenarios and their presentation had the affect of orienting the policy discussions toward the future, the scenarios were not used directly. To be effective, scenarios and associated cognitive maps need to be internalized by the users. The war scenarios were familiar to the participants but the theme scenarios were not, and the participants did not accept them. The following comments made by one of the participants are instructive.

- The theme scenario gave him no new "wild cards"
- The theme scenarios could be strengthened and should be included in future planning
- The results of the scenarios should be presented so that the spectrum of impacts is clearly comprehended. The presentation might be in a form "akin to a decision tree" with the more probable consequences in the middle branches and the "wild cards" at either side.
- Input from general officers might be obtained to assure that low-probability, high-impact trends or events are identified and taken into account.
- Some of the input might be in the form of quantitative judgements for a cross impact analysis.

- o Creative "packaging" would be needed if a cross impact analysis were used.

As a consequence of the reaction of the participants, the scenarios were not pursued during the balance of the Randolph meeting, and trend forecasts have been adopted for subsequent LMS planning. Nevertheless, Battelle believes that scenarios are useful long-range planning tools and should, with suitable adaptation, be considered for future use. They have the distinct advantage of enabling the portrayal of alternative futures as contrasted with a single future that results from the use of forecasted trends. However, based on the reactions of the participants at the Randolph meeting, it was clear that:

(1) The presentation of the impacts of the scenarios on AFLC would have to be made clearly visible.

(2) The rationale for the impacts should be easily traceable, perhaps through a tree-type structure.

(3) At least some of the participants in future meetings should be involved with developing the scenarios/impacts so they are viewed as an Air Force product.

Assuming that the above requirements could be satisfied, scenarios are recommended as an important input to future policy planning sessions.

ANALYSIS

The following paragraphs describe the original requirement for analysis as described in Paragraph F-5, Contract F33600-80-C-0414.

> Analysis: Develop methods of analysis for the anticipated long-term, long-range planning data gathered to ensure: Comprehensive identification of all needs, identification resolution of conflicting/varying needs, identification and handling of individual needs that vary by scenario, identification of the justification of need, and documentation. The results of the analysis must ultimately support AFLC decision making; therefore, the analytical methods and techniques developed herein must address this requirement and have the capability to support an approval/review process. As the long-term effort will require management of change, the methods and techniques recommended must support such management.
>
> a. The contractor shall present a report of the expected types of analysis required. This report shall include: The information to be analyzed, the purpose of these analyses, the use of the results, the expected outputs, the recommended group to perform the analysis, the sequence of analyses, and the carryover between sequential analyses. This report shall be amended as approved by the government.
>
> b. Upon approval of 5a above, the contractor shall prepare a description of alternative analysis techniques including: Data required to perform analysis, resources (man & machine), availability of resources, and types of decision criteria. This report shall recommend the technique(s) and methodologies to be used. The techniques of analysis and the criteria to be applied must be readily understandable, acceptable and demonstrable to gain credibility.
>
> c. The contractor shall prepare descriptions of alternative documentation techniques for both the analysis and the results of the analysis. This report shall recommend the most appropriate technique(s). The recommendation shall consider cost, time, and clarity of the various alternatives.
>
> d. The contractor shall present a plan for exercising the analysis and documentation techniques using the output of the planning sessions.
>
> e. Upon approval/modification of the plan, the contractor shall perform the analysis and provide a report to the government.

(1) The contractor shall ensure the analytical methods and techniques are consistent with the appropriate methods developed in other tasks, that necessary support is provided for the analysis/decision making, and that lessons learned are documented for later use. (see para 3e).

(2) In those situations where the type or character of analysis requires in-depth AFLC logistics knowledge, the contractor may use appropriate AFLC personnel; however, it shall be prepared to carry out the analysis in the event the government personnel are not available

As part of the development of LMS planning methodology, Battelle was required to develop techniques to assure the adequacy of the planning results. Many of these techniques are integral to the LMS planning methodology. This methodology is structured into three levels using a top-down approach. The approach builds logically on AFLC corporate plans to define logistics management systems that will fulfill the requirements functionally and in a way that is consistent with AFLC policies.

Basically, the analysis activity is needed to evaluate the planning process and planning results with respect to:

- o Consistency. Validate traceability of LMS requirements to the policies and decision structure developed in previous planning sessions, the LM and LMS concepts, and the LMS principles. Note those information needs, concepts, and principles which find little or no fulfillment in the LMS information requirments. Note those requirements which are not broadly based on information needs, concepts, and principles. Note inconsistencies with the decision structure and policies for the planning area.

- o Coverage. Validate the LMS requirements (and needs) in terms of completeness with respect to covering the LAG representation of the logistics processes, the management functions, decision structure, and the data requirements and sources for the planning area.

- o Documentation. Validate LMS requirements documentation to ensure that it is necessary and sufficient both in content and format from the perspective of its subsequent use of either Level II or III planning or in development of a DAR. The design options should not be unnecessarily restricted by extraneous detail.

- o Interface. Validate interface assumptions at the LAG, needs, and requirements levels to ensure that they are consistent for the functional area and the greater LMS concept. These interface assumptions should be documented for reference for future LAG areas and validated with prior LAG areas.

- o Methods/Materials. Validate the appropriateness of planning materials and methods and their impact on the achievement of quality results and the planning purposes.

In the earlier stages of the planning, it was impossible to identify specific analysis tools because of the conceptual nature of the methodology. As the planning methodology was prototyped and specific output was generated, the identification of analysis tools was possible.

The Consistency and Interface factors have been built into the FCMS by XRB. Documentation requirements for each of the three levels of planning have been defined and are currently being formalized in the respective volumes of the LMS Requirments Handbook under Contract No. F33600-81-C-0613.

With regard to Methods/Materials, the planning undertaken in the Maintenance and Weapon System first-start areas has resulted in refinement of the planning methods and materials. They have evolved to the point where they are currently begin formalized in handbook form as mentioned in the preceeding paragraph.

LMS PRINCIPLES

The following paragraphs describe the use of LMS principles, as identified in Paragraph F-6, Contract F33600-80-C-0414.

> LMS Principles: Develop a set of LMS principles to be used in guiding the formulation of LMS requirements and other products of the long-range LMS planning project. Further, it is envisioned these principles will be compatible with and used with principles developed by ADP planners.
>
> a. The contractor shall prepare a list of areas within which such principles are envisioned as well as an indication of the general character of the principles within each area. The list shall be presented to the government for comment.
>
> b. After government comment, the contractor shall identify the principles to be used and submit a report showing:
>
> (1) Area of principle
>
> (2) Principle - one sentence (normally)
>
> (3) Description or discussion of implications of principle
>
> (4) Source and justification of principle
>
> (5) Those areas/principles which cannot be defined because related logistics principles are not available.

Under Task F-6 of Contract F33600-80-C-0414, a set of LMS principles was developed for use in guiding the formulation of LMS requirements and other planning products. The principles were developed in two steps as discussed below. First a framework was developed for deriving LMS principles and then the principles were actually developed and documented.

A Framework for Deriving LMS Principles

The principles that govern LMS development are derived by examining the major elements that come together in Logistics Management. They are:

- o Logistic doctrine, which is derived from Air Force doctrine. This source provides insights into what the logistics system must do to perform its role in the Air Force.
- o Management principles, the basic rules that govern management of complex systems. These principles are found in accepted texts and the teachings of effective managers. They involve such principles as span of control and delegation of authority.
- o Principles that govern the day-to-day operations of logistics. These include what it takes to get the job of logistics done.
- o Fiscal control principles. The rules by which funds are approved, made available and controlled. This area includes the criteria of regulatory and advisory groups that influence the ultimate outcome of the development effort.
- o Information management principles. These are the mechanisms, techniques, policies, and procedures necessary for planning, developing, implementing, and managing information processing.

Each of the sources of principles may give rise to a distinct set of principles which may or may not be compatible. Figure 1 defines the relationship between the various source of principles that may influence or constrain LMS development. The regions in solid blocks were sources of principles that were examined to develop the set of LMS principles.

Recommended Principles

The LMS principles stated in Table 1 were selected from Air Force and DoD source documents based on their direct applicability to LMS design, accepted system planning and design practice, and logistics operations. In each case the principle is followed by a short discussion of the LMS implications of that principle. Each of these principles and their implications should be kept firmly in mind as the LMS design process proceeds.

How to Apply Principles

The LMS principles form a reference frame in which to construct and evaluate LMS change objectives and alternative approaches. Many of the plan-

ning participants may be expert in some aspect of LMS but may not be familiar with all aspects. The existence of a meaningful set of LMS principles provides a means of evaluating alternative concepts. As concepts are postulated they should be evaluated to determine compliance with the principles. In those cases where there is conflict with the principles, both the concept and the principle should be reexamined. By this process the principles will mature and become more explicit. The concepts which emerge will benefit from the evaluation by exposure to a consistent set of principles early in the concept formulation phase.

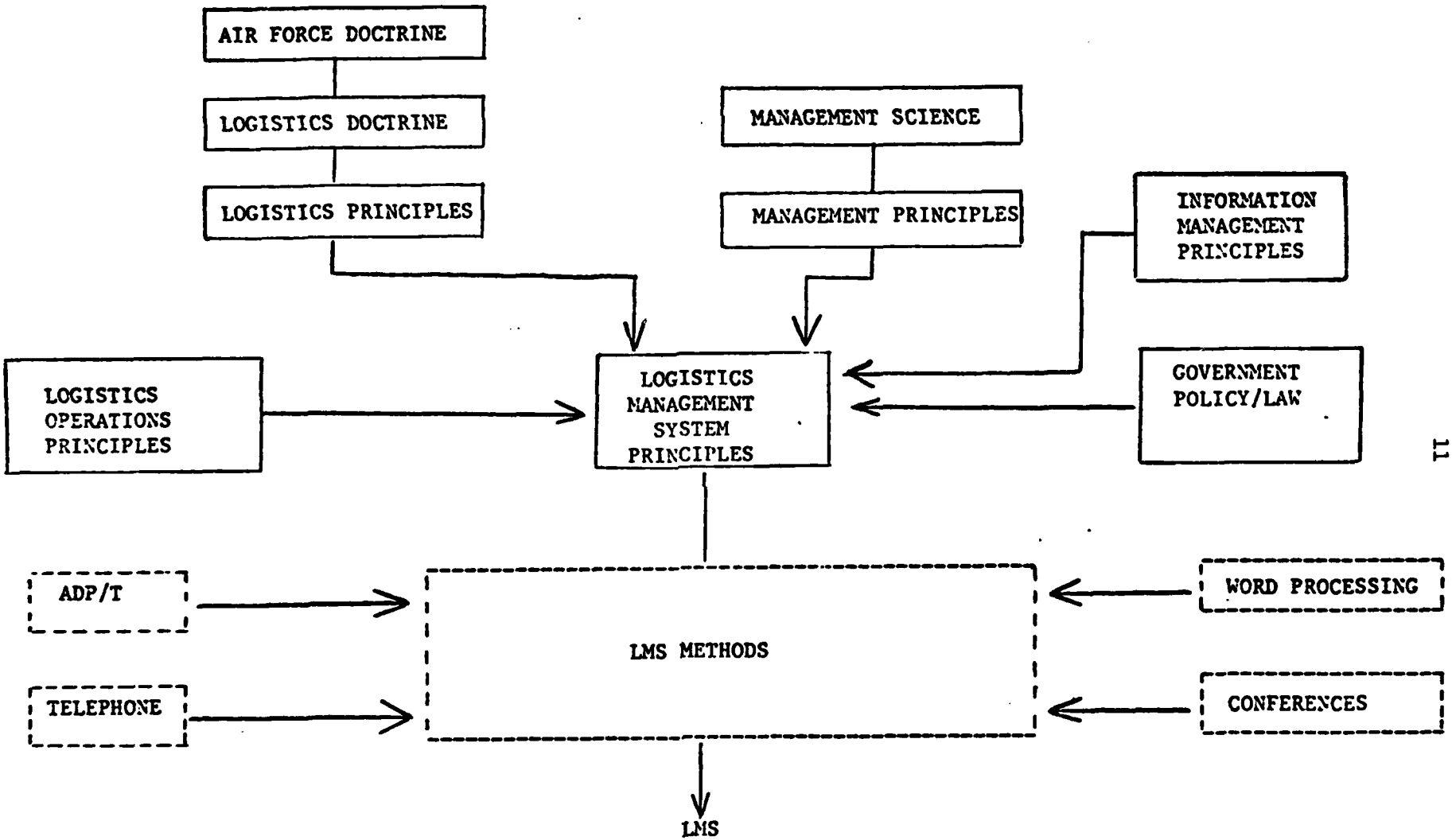


FIGURE 1. RELATIONSHIP BETWEEN SOURCES OF LMS PRINCIPLES

TABLE 1. LOGISTICS MANAGEMENT SYSTEM PRINCIPLES

Principle:	Commanders must have full visibility of their logistics capability.
Source:	AFM 1-1.
LMS implication:	LMS must provide the means of visibility of logistics capability at the wholesale level. This visibility must be such as to provide current status on the systems ability to sustain operations. Potential impediments must be continuously identified and quantified.

Principle:	Logistics must be flexible to meet the changing needs of operational commanders.
Source:	AFM 1-1.
LMS implication:	The modern environment of conflict is dynamic. Logistics must be capable of altering its approach to meet these changing needs of operation. Management systems must not be so rigid as to preclude effective response.

Principle:	Logistics must be economical in peacetime and responsive in wartime.
Source:	AFM 1-1.
LMS implication:	The system of management must be able to minimize cost over the long peacetime periods and still be able to react to no-notice wars.

Principle:	Unity of effort in meeting logistics support requirements for accomplishment of national security objectives requires joint centralized planning.
LMS implication:	The LMS must provide inputs to joint planning efforts and then be geared to reacting to support those plans consistent with the input. This makes it necessary for the LMS to be able to accurately forecast AFLC's capability to support a variety of scenarios and then maintain a management watch on the commitments ensured by the plan. There must be a system to show senior logisticians the extent of previous commitments and to permit them to react quickly when any plan is executed.

TABLE 1. LOGISTICS MANAGEMENT SYSTEM PRINCIPLES (Continued)

Principle:	Logistics must be guaranteed serviceable by protecting resources from enemy actions, natural disasters, theft, and physical decay.
Source:	AFM 1-1.
LMS implications:	The LMS, as a critical resource, must be protected from enemy action or natural disaster. This requires that backup modes or work-around plans be developed for all critical modes of the LMS. It also implies that a program be established to assess the criticality of LMS modes so that effective planning for their protection can be maintained. Protection of logistics resources implies an effective system for knowing what the status of assets are at all times so that corrective actions can be initiated in a timely fashion. Ideally, this would be accomplished before there is an actual shortage of an asset.

Principle:	Above all, logistics must be as simple as possible and provide the right assets to the right place at the right time.
Source:	AFM 1-1.
LMS implications:	There are three major LMS implications in this principle: (a) Simplicity of the system applies directly to the LMS. It must be such that the logisticians that operate it have full confidence in their ability to control the system and use it to their advantage in periods of stress. Complex systems, no matter how effective in theory, will lose their effectiveness if the people who operate them do not feel they are in control. (b) Getting assets to the right place at the right time in a dynamic conflict environment requires the ability to redirect asset movement after the movement has been initialed. This in turn requires that visibility must be maintained over the asset in transit and some means provided to redirect that asset if required. (c) Since the customer is sometimes another Service, there must be a viable means of interacting with that Service at the management level. This means should produce the same responses as support to Air Force units.

TABLE 1. LOGISTICS MANAGEMENT SYSTEM PRINCIPLES (Continued)

Principle:	**Logistics Systems must be designed to make maximum use of available defense resources, and to apply the techniques of standardization, uniformity, or integration when such application is cost effective and will not degrade mission capability.**
Source:	**DoD LOGPLAN 1972-1980.**
LMS implications:	**Every effort should be made to generalize the use of existing systems or new systems that are developed. This applies across AFLC, the Air Force, and DoD. It also implies a degree of standardization with NATO and with our FMS customers.** **When introducing a new LMS design there should be a thorough examination across AFLC, DoD, NATO and FMS to identify existing systems that meet the same need or to identify opportunities for use of this new system on a broader basis. This consideration frequently conflicts with short-term cost and schedule considerations but can produce significant long-term benefits if properly applied.**

Principle:	**Systems must be designed to function within the framework of existing organizational structures, yet be capable of adjusting to organizational change.**
Source:	**Accepted Practice.**
LMS implications:	**The implications of this principle for logistics management systems is quite broad and applies to several levels or perspectives. First, design of an LMS must take place within the operating policies and procedures of AFLC--this provides the guidelines for how the system must function. Second, to ensure that organizational constraints and requirements are met, design of the LMS must involve input from all levels of AFLC who are potential users of, or contributors to, the LMS. Third, the requirement for adaptability must be considered when selecting technologies to support an LMS. For automated portions of the LMS, this may mean selection of those hardware/software technologies most likely to support flexibility--e.g., data base management systems, report generators, etc. Fourth, adherence to this principle will require consideration of specific management control mechanisms to promote comprehensive planning, monitoring, and resource allocation for the LMS on an on-going basis.**

TABLE 1. LOGISTICS MANAGEMENT SYSTEM PRINCIPLES (Continued)

Principle:	The LMS should not require extraneous activities of its users, and should function to support professional activities.
Source:	Accepted Practice.
LMS implications:	This principle has particular implications for automated systems which support logistics management. Such systems exist to support organizational functions--functions ultimately performed by people. Successful operation of the LMS will be dependent on its users. Systems not designed around how people do their jobs tend to: • fall into disuse across time • create negative attitudes towards systems.

Principle:	The LMS should utilize technologies appropriate to supporting and improving logistics management.
LMS implications:	The design of an LMS should seek to maximize the efficiency of logistics management. This would include *choosing* technologies which will enhance LMS performance. One consideration here would include being aware of opportunities to improve logistics management procedures by taking advantage of the capabilities of available technology (e.g., using word processing to produce standard documents). On the other hand, technologies selected for the LMS should be proven technologies. The critical nature of the logistics function should preclude "pioneering" efforts in the use of new technologies.

Principle:	The LMS must ensure management visibility commensurate with authority and responsibility.
LMS implications:	This principle includes not only traditional consideration of span of control and delegation, but also concern with appropriate flows of information. Effective management requires, among other things, access to reliable information in a timely manner. During LMS design, managers at all levels must ensure that their information needs will be met by the system.

LOGICAL APPLICATION GROUPS (LAGs)

The following paragraphs describe the original requirements for the use of LAGs, as identified in Paragraph F-7, Contract F33600-80-C-0414.

> Logical Application Groups (LAG): The contractor shall prepare appropriate explanations and documentation for those LAGs to be used during the planning sessions. It shall further use information gained during such planning sessions to update the LAG descriptions and documentation prepared under contract F33600-78-R-0510.
>
> a. Using the methodology and framework developed during the short-term effort, the contractor shall describe the selected LAG(s) (or portion thereof) in a manner suitable for presentation and use in the planning sessions.
>
> b. During the planning sessions, the contractor shall determine the appropriateness of the boundaries of the selected LAGs and make recommendations for their change, if required. These changes shall be limited to the subject LAGs but will include annotations to other affected LAGs, as appropriate. The final output of this task will lead to a mutual understanding between the contractor and the government of the content, boundaries, and interfaces of the session-selected LAGs. Annotations to other (not-selected, but affected) LAGs will be made as appropriate. However, no substantial changes to nonselected LAGs beyond simple annotation of recommended changes will be made.

LAG descriptions and documentation were prepared initially under a previous contract (Contract No. F33600-78-C-0510). This activity was followed by an XRB-led effort to develop the Aggregation Extract Charts that further developed and defined the LAGs and associated them with the Process framework that had been developed previously by XRB and established within the Command.

The first application of the LAGs took place during a Needs Planning Session held at Randolph AFB, San Antonio, Texas, July 14-19, 1980. Both the background and application of the LAG concept were discussed in the notebook prepared for this session as well as the LAG prepared for analyzing Maintenance Production Management.

The next two applications of the LAG concept were to LMS planning for Weapon System Management and Maintenance. Both of these areas were

selected as high priority "first-start" by AFLC, but are quite different in nature. Maintenance is a well defined process with a corresponding management structure that deals with both the contract and organic maintenance functions. Detailed LAG and Agg-Extract charts had been developed for both aspects of the Maintenance Process. On the other hand, Weapon System Management is a perspective that cuts across almost all aspects of AFLC operations depending upon the scope attributed to the perspective. In fact, the scope and functions were not well defined and accepted. Considerable effort was devoted to developing a functional model of Weapon System Management that was used in Level II planning to define a LAG for consideration of the problem of tracking the status of weapon systems by base. The procedures for developing or redefining LAG boundaries are integral to the Level II LMS Requirements Determination planning procedure that is currently being documented in a handbook developed under Contract No. F33600-81-C-0613.

While the starting position for Maintenance planning was well established, during the Level II planning the Maintenance functions were better defined and the LAG boundaries adjusted. Particular attention was given to the Production Scheduling LAG which was successfully pursued as a Level III planning effort and resulted in the development of an RSC for a Maintenance "first-start".

As currently defined and implemented, the LMS Requirements Determination Process is designed to focus on the LMS requirements of specific LAGs as individual Level III planning activities. LAG boundaries are defined and/or adjusted as part of Level II planning which addresses the process or perspective requirements. During Level II planning the logical decomposition and grouping of functions within a specific process or perspective are addressed and LAGs defined for consideration in separate Level III LMS requirements determination planning. Thus the LAG concept is an integral part of LMS requirements determination and is the specific focus of Level III planning.

In the notes for the San Antonio meeting, Battelle made the point that,

> As far as can be determined there does not exist within AFLC a mechanism for the control of the interfaces. One will have to be created if the benefits of LAGs are to be realized. The mechanism must consider the control of interfaces during the development of LMS and ADP concepts as well as managing

> these interfaces over the life of the systems. To be effective the interface control mechanism must be capable of dealing with the logistics system, the management information system and ADPE systems. Development of this mechanism will be a significant but essential task. The final criteria for LAG boundaries depend on the concept of the configuration control mechanism.

The control mechanism has now been identified by AFLC/XRB. It is the Functional Configuration Management System (FCMS) that is currently under development. The FCMS is designed to maintain visibility of LAG boundaries as well as interface requirements for associated LMS. Thus, the concerns expressed in July, 1980 have been largely alleviated through definition and implementation of the FCMS. With this system now being loaded and brought on-line, the LAG concept is now more than ever a key component of LMS requirements determination.

CONCLUSIONS AND RECOMMENDATIONS

Three of the four areas described in these lessons learned, Analysis, LMS principles, and LAGs, are still part of the planning methodology in some form. Their specific use may be somewhat different than was originally intended, but all three remain important in the current planning activities.

The fourth area, scenarios, is no long being used, having been replaced by trend analysis. BCL recommends, however, that the use of scenarios be reconsidered in the future, and that further activities for their development be planned.